

ART. X.—*Notes on the Storms of High South Latitudes.*

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IT is to the southern hemisphere that we must look for an explanation of phenomena attendant on all cyclonic and anti-cyclonic systems. To the southward of the 39th parallel there is nothing to stop the storms in pursuing an uninterrupted course round the world, and none of those disturbing areas of high temperature that are found in the northern hemisphere.

It is my intention, in this paper, to endeavour to show, from an isolated and entirely observational point—first, the general appearance of this region between 39 deg. and 60 deg. S., as seen by a spectator placed at some distance above the earth (supposing it to be possible to see the storms actually); second, general formation and weather attendant on them; third, cloud motions, and general prognostics to be obtained from them; and fourth, direction of propagation or movement.

If an observer outside, and perfectly independent of the earth, were to watch the motions of the atmosphere over this belt, he would probably see that there is a general prevailing set of the surface-wind towards a south-easterly point, and a set in the upper regions towards a north-easterly point; but this would be so broken up in some places by cyclonic and anti-cyclonic systems as scarcely to be discernible. In some places would be large irregular anti-cyclonic areas, while in others there would be strings of cyclonic disturbances. If he still watched, he would see the anti-cyclones broken down by the cyclonic disturbances, and forming again in other places; in fact, the whole system would be propagated round in an easterly direction. In summer time the appearance would be much more irregular, caused by the sun's influence. Off the continents of Australia and South America there would always be breaks, caused especially in the former by the large interior hot surface.

2. I propose the following ideal figure to represent approximately the shape of these storms, which seems to answer to all the veerings, &c., much better than anything else I have seen. Of course it is very unlikely that one would ever be seen so regular; but this is only to give a general idea. The shape they seem more generally to assume is elliptical, the southern half being a great deal broken up and more irregular than the northern, though it still exists, and can generally be traced. The isobars in front are very much compressed, caused by the resistance to its propagation, while in the rear they are often greatly extended. The following general description of one will show reasons for this, and also the general incurving of the wind outside and near the centre:—Barometer steady; light airs or calms; then light wind begins to make from N., with cir.-s. spreading over sky. Wind backs more to N.N.E., and barometer begins to fall. Soon after the clouds begin to lower, and it becomes quite overcast; barometer falling fast, and rain coming on; wind steadily freshening with hard gusts, backing still more to N.E. by N., where it keeps steady for some time. When the barometer falling more rapidly, rain comes on heavy, and wind again backs to N.E. The glass will now stop going down, and there is generally a lull for a few moments, and the wind suddenly shifts round to the westward with hard squall. This is supposing the centre to pass over observer. It will now clear up, but keep squally till the wind veers round to S., falling lighter all the time, and barometer rising. When S.E. there will be light airs and calms. They seldom go single, but several follow one another in succession, the wind then, after getting to S., backs again instead of going round. It is a remarkable thing how very seldom the wind goes right round to E. and N.E. by S.E. It may apparently seem to, but in most cases that this is observed light airs and calms are noted, and the cases are rarer of its going completely round the other way. After several of these an anticyclone will probably be experienced, the wind conditions in which are almost exactly the reverse. The weather fine and dry, and a good deal of a well-known dry weather stratus about. The wind changes quickly from S. or S.W. to a north-westerly point, and the stratus cloud breaks up before the next disturbance comes on. The anticyclones seem to have little or no movement in them.

In a case where the centre passes well to southward of an observer, the wind does not shift suddenly, but veers

gradually round to the westward. Heavy gales are occasionally experienced from the eastward of S., and when they come are generally lasting, and the weather takes some time to clear up. One thing especially tends to show the prevalence of westerly winds, which are the prevailing winds in the rear of these disturbances, is the constant, steady swell from that quarter, which can, with a few rare exceptions, be always traced. It is very noticeable before the cyclonic disturbances set in, and when the wind gets round to the quarter from which it is coming, it soon mounts up into the tremendous, regular seas, only to be seen in these parts of the globe. The temperature of the water does not seem at all affected by the shifting of the wind, though the air generally is to the extent of several degrees.

3. The movement of the upper clouds in these storms seem to be much more regular than they are in the northern hemisphere. Observations on their movements as observed from a ship are very difficult, on account of the double motion of rolling and going ahead, and especially when there are other clouds beneath, which then makes it appear as if the upper were in movement. I have frequently found old sailors even giving a point from which they are coming almost opposite to their real one. I shall now again take the case of a storm passing over an observer. It will be found that cirri first appear on and parallel to north-western horizon, and will apparently be moving from that point; but it will soon be seen that their movement is almost from a point at right angles to this, but they will appear to be spread over the sky from N.W., and the motion would probably be noted in nine cases out of ten that they were coming from N.W. But it will be found when they arrive overhead that they are moving from S.W., but are still being propagated from the north-westward; they thus have a twofold motion: These lines are often very perfectly formed, and all appear to meet at two points—S.W. and N.E. There will also be a slight short stratification across the lines at a large angle.

The more gradual the forming and propagation over of the upper cloud, together with its perfect form, as above described, the more severe and lasting the storm; but it must be understood that there are storms which are not forecasted in this perfect way. As the storm approaches the cirrus becomes denser and lower, till the sky is covered with a uniform layer, without any stratification; and, if the motions can be made out, they will still be found to come

from some point to southward of W. The stratification often appears at intervals after the rain has set in, when the threads or lines will be found to have backed—that is to say, the line of direction of the threads will have moved round till they lay from N.W. to S.E. The storm is now in full force, and it is only at intervals that the upper clouds can be seen; they will be seen to be moving from a north-westerly point till the centre has passed over. It often happens that at or near the centre the weather clears up for a time, when the sky will be seen full of dense fragments of cir., cir.-s., and cir.-c., very much broken up and watery-looking, enveloped in a thick haze, all moving from a north-westerly point. But the sky soon becomes overcast again till the wind shifts round to a south-westerly point, when all the upper clouds will be found to have left, fragments only here and there moving from a south-westerly point. Large cumuli clouds are now continually formed, which are edged by cirrus-looking clouds, and seem a good deal affected by electric action, as seen by their abrupt serrated edges, sticking out in all directions above the cloud, and apparently strongly repelling each other's ends. These are also more or less attended by vivid flashes of lightning, which at night-time are a valuable warning of the approaching squall, before the cloud itself becomes visible. There is generally a strong gust of wind in them, and heavy downpours of hail and rain, but only for a short time, the wind also being unsteady, varying at times several points, mostly towards a more southerly point.

One thing may be worth noticing before passing on—it is the warning that the wind will soon veer to the southward when it is at W. or W.N.W., with fine weather. Fine high hard-looking cirrus clouds which, in the neighbourhood of the sun exhibit the most beautiful prismatic colours, and when the moon is up at night-time a green corona, at times very well defined, round it against the blue sky. It would be a valuable help to upper-cloud observations if the places where the cirrus is parallel to the horizon, and the apparent radiant points were always noted down, for, although it is noticeable that in the northern hemisphere the movements are very eccentric at times, yet to the southward I have always noticed that they move from a point, almost, if not quite, at right angles to the point to which they are parallel; and these points could always be noted with great exactness, whereas the point from which they move is not exact often,

Ideal Cyclonic Disturbance, S. Hemisphere.

